

INTRODUCTION OF AUGMENTED REALITY AND VIRTUAL REALITY IN THE GROWING EDUCATION SECTOR: A REVIEW

Saket Badge¹, Tripti Dhote²

^{1,2}Symbiosis Institute of Digital and Telecom Management, Symbiosis International (Deemed University),
Pune, India.

Email: ²tdhote@sidtm.edu.in

Abstract

Technology has been growing fast and influencing different aspects of life such as healthcare, entertainment, and many other fields. Education is the base for a flourishing society, and the transfer of knowledge has been a top preference for civilization since the very beginning. The education sector is using technology like smart teaching using video lectures, distance learning, and other technology. Reality technology has capabilities to make good engagement with a learner using advanced graphics and interactive videos. This 3-dimensional world of education is effectively changing the traditional teaching method. These reality technologies use combining the physical and virtual worlds. Using advanced technology anybody can learn anything using the internet, for better engagement augmented and virtual reality will help lots of learners. This article will provide information about the implementation of reality technology in the Ed-tech industry and comparison analysis of different Ed-tech platforms which are currently providing a reality technology..

Key words: Augmented reality, Virtual reality, education, Ed-tech

Introduction

By 2025, the millennial generation will constitute two billion of the world's population: Generation Alpha, also known as the iGeneration. It is the first generation in the 21st century born entirely. Those students are considered the most up to date demographic infused with technology. Generation alpha obviously makes use of technology, smartphones, laptops, and computers. They hadn't experienced life without the internet or video games.

Even today distance learning is a part of the education system. Students and learners are spending their time on online courses and certification to get knowledge in a particular field. All this happened because of a good network and new education technology. Many ed-tech platforms emerged with a new system of teaching, some came with live classes, some came with distance learning with prerecorded video lectures with advanced graphics, which help the learner to get easy understanding. Augmented reality and virtual reality technology are accepted by all fields, like healthcare, entertainment, hospitality, research, and many more sectors. The education field is also in that.

Augmented reality is an immersive real-world environment where the viewer can feel the objects using multiple sensor modeling including visual, auditory, haptic, and somatosensory. The combination of the virtual world and the physical world can help in all sectors. The education field can use this technology effectively to express knowledge. Real-Time interaction and the 3D virtual objects can express science adequately. Virtual reality is an assumption concept that can be similar to the real world, or completely different. The video game sector is using this technology to provide a real experience of the game to their audience. In virtual reality to use this virtual world VR headset or multi-projected environment to develop a realistic sound, image, and other sensations that replicate a user presence in a virtual environment.

Ed-tech Startups like Nearpod, Merge, VR education, Discovery VR, Alchemy VR, EON reality, and Curiscope have already started their implementation of augmented reality and Virtual reality technology in the education sector; they used VR headset technology for their learners. Conceptual background related to the use of augmented reality and virtual reality education and theoretical modeling is presented. AR/VR/MR has many benefits in the classroom, including improved comprehension of content, a stronger grasp of spatial structures, increased awareness of language connections, long-term memory retention, and increased student motivation.

Objective

This paper aims to study the reality technology implementation challenges and study of available trending technology, how technology improvement will provide opportunities in the education industry with research on organizations that have implemented reality technologies to provide better learning's.

Literature Review

Many science concepts are very difficult for teachers to explain it on board. Technology is approaching further many interactive graphical videos are produced to show the exact working of the system. Information and communication technology is trying to ease every domain with the help of technology, the field of education has not been unaffected by the penetrating influence of information and communication technology. ICT impacted the quality and quantity of teaching, learning, and research in traditional as well as distance education [1].

In the '80s when educational institutes started using computers, teachers thought that this machine will take their job in the coming future, but this approach was made wrong through the journey of computer technology in education [2]. Demonstrated that uplifting mentalities toward computers decidedly correspond with teachers' degree of involvement in computer technology innovation. Development in the education sector, the importance of teachers who have good knowledge of computer technology is demanded.

In the world there are 500+ Ed-tech platforms catering to the different age groups of students, they have categorized themselves to provide their services like learning videos for preschool, high school, and college students. This is trending all over the world, people are trying to learn many things through online lectures, as technology is enhancing this learning experience providing better engagement to the learner. The ability to overlay computer graphics onto the real world is commonly called Augmented Reality (AR). This reality is providing an easy explanation to the students and learners. Unlike immersive Virtual Reality, AR Interfaces allow users to see the real world at the same time as virtual imagery attached to real locations and objects [3].

Augmented Reality

Augmented reality is the result of using technology to superimpose information, sound, image, and text on the world we see. The 1st appearance of Augmented Reality (AR) date backs in the 1950s, it was used in cinema for making cinema more interactive [4]. After the innovation of advanced computer technology, it was easy to apply augmented reality. In recent years augmented reality (AR) has gained much attention. Innovation assumes a significant opportunity in AR research. In some past research, the term innovation is a piece of the meaning of AR. For instance [5] characterized AR as an innovation that mixes genuine and virtual world experiences. Currently, every industry is using AR technology in their operations. This technology is making their work easy and understandable. AR's research focuses on the physical world with a lot of digital knowledge; AR examines learning in real-world contexts that are slightly improved by digital mobile app knowledge [5]. Ed-tech Grib is working on AR in the desktop and mobile devices. Grib 3d developed a friendly app that uses AR technology to allow 3D design in the real world [12].

Virtual Reality

Virtual reality is a software-generated, artificial world applied to the user in such a way that the user suspends belief and embraces it as a real environment. Virtual reality is perceived mainly by two of the five senses: the sound and sight. Virtual Reality (VR) is a common term for an immersive, interactive, computer-mediated experience where a person perceives a virtual (simulated) world through the special human-computer Software interface. It interacts with objects represented in that environment, as if they were real [6]. Virtual Reality with Artificial intelligence and Augmented Reality is making the virtual workplace for the virtual teleconferencing. People learn by getting experiences, communicating with their surroundings, and using their senses to extract worldly knowledge. Virtual reality is a technology that replaces real-world sensory input with sensory input created by computer simulation [7]. Researchers are working on different projects related to virtual reality. VR applications are able to penetrate all the technology domains. The entertainment industry made VR enabled movies that are compatible with VR gears. Similarly, the education sector can also make learning more

interactive with the virtual learning experience as AR is already implemented in education platforms similarly VR will be applicable to the education sector. Modern education also

Augmented reality Vs. Virtual reality

AR is the fusion of the real world and the imaginary world. The digital world is imitated on the real word. While Virtual reality is changes the reality by immersing the user in the fully imaginary world [8]. The spatial presence between AR and VR is that the AR condition is largely unmediated. Therefore, there are more sensory cues as to one's spatial location. But there may be more to this than the lesser level of sensory cues [9]. Augmented reality is ahead of Virtual Reality because there are already many services in the market. Virtual reality has some limitations, providing whole real experience on digital platforms is difficult and researchers are working on the graphics technology to provide exact experiences to the user [8]. AR environment helps users to explore the unmediated direct presence experience while Virtual reality is more based on mediated reality [9]. Using both Augmented and Virtual reality in the technology called mixed Reality or merged reality. Their user can touch the virtual world and use the technology as per their preferences [10]. Merged reality technology is very complicated and takes time to build a virtual interactive world. The graphical interface is an important part of the merged reality to access each detail by the user [10]. Merged reality can be best suited for the students and in the educational system but the infrastructure for that system required more inputs and sources to make a better educational world.

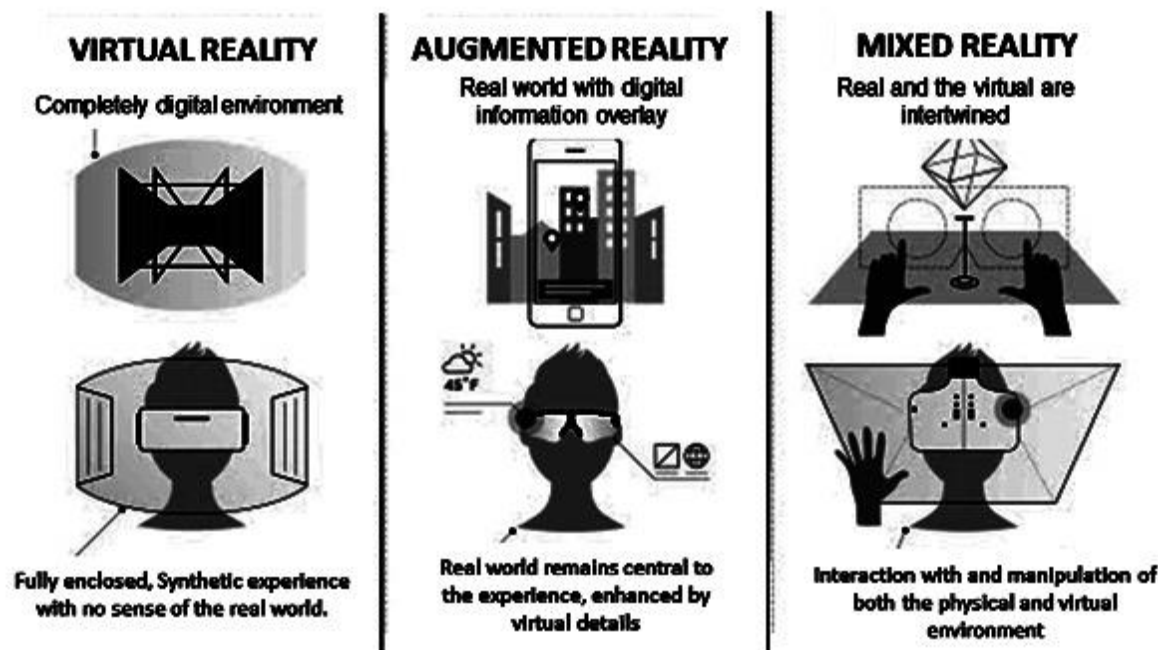


Fig.1 Differences in AR, VR and MR (State, 2017, appliedart.com) [14].

In the educational field, some subjects are more focused on the application of Augmented Reality. Science, Humanities & Arts are the educational areas where AR was mostly applied. Health, Welfare, and Agriculture are the least studied areas of research.

There are many concepts in science that can be explained using augmented reality so that it can be easily understood by the students and learners. While some subjects which are more based on the theoretical part they can be explained with augmented reality with less graphical changes. Medical fields are using augmented reality extensively, anatomy knowledge is not available for the medical students, these classes conduct practical lectures; they have made AR anatomy classes for the learners so that without practical equipment they can learn detailed information on human anatomy

Research Methodology

Through this research, we will highlight the effectiveness of Virtual Reality and Augmented Reality for education through various research papers published in the fields of Virtual Reality and Augmented Reality. This concept study includes secondary research from Reality Technology's relevant area. Considering AR and VR's dynamic technology, this research analyzes the conceptual models that various organizations are implementing to incorporate reality technology into education.

Overview Of Current Trends: Reality Technologies In The Education

Augmented and virtual reality is one of the trending technologies which is used in education apart from that there are several other technologies that are also available to enhance learning. Custom learning experiences, cloud computing, 3D printing, and digital leadership are the example of trending technologies in the education sector, But the study shows that these technologies are focusing more on higher education and also require the basic knowledge to the user while using this on the grounds. While Augmented and virtual reality can be used by any age group learner which makes it efficient to serve. Even the implementation of this technology using the AR and VR gears is simple for the user.

Technologies used by Ed-tech platforms in India

Worldwide very less Ed-tech platform started to provide learning with virtual reality, it will take time for the organizations to create infrastructure for the virtual reality world. To cope up with the latest technology, Ed-tech platforms are using such technologies in their operations, which are like Virtual assistance, Deep learning, Artificial intelligence tools, YouTube to discriminate information, and learning analytics. Virtual Assistance is the technology that uses the internet to provide an answer to your questions, like Apple Siri and Google Assistance. These are the famous examples of Virtual assistance. The Mumbai startup named "*learning Matters*" made their product which provides the virtual voice teacher and activity-based teaching, these products are using the virtual assistance technology with available devices.

Developing from the core of Artificial Intelligence, deep learning copies the functioning of the human brain so that data can be interpreted and patterns understandable. Then such patterns can be used for decision making. India-based startup "*iSchoolConnect*" is a website that supports the education sector by easing the process of college searching and applying directly through there portal. The program matches students to the course they are searching for using predictive modeling by using deep learning techniques. It also allows a single student interface so they can send their applications from one location to multiple universities.

There are not many sectors that have missed the AI advantage, and Ed-tech has also benefited from the use of AI. Many applications use AI to advise students on their career paths. The tools help them to receive guidance on various courses and colleges that provide matching skills for education. There are platforms that are popular for entertaining content, and when a user stumbles on educational material on the same platform, they are more likely to shift to learning on that platform. A video streaming platform YouTube, for example, has many pages devoted to insightful and informative videos. And, they have a lots of followers. Famous Indian Ed-tech platform Unacademy uses this technology to handle more learners on one platform and it is very easy for the user to access YouTube. All these advanced technologies used by the different Ed-tech platforms to provide their services effectively and efficiently. These technologies are the USP for those platforms. More examples of international companies Neo Bear, Strivr, Health Scholars, Mursion, PlayShifu, Lingumi, Interplay Learning, Immersive Tech, BLVRD, Innoactive [13].

Advantages Of Ar/Vr In Education

The development of an innovative and engaging learning opportunity without the use of school books, AR and VR technology facilitates learners to discover and gain new knowledge. VR and AR-based educational apps, combining communication technologies with teaching practice, enhancing the teaching experience, and allowing students to visually gather data. Why should we have to use AR and VR technology in the classroom?

Traveling around the world to discover places without having to leave the classroom, Build empathy for crisis societies by walking into their shoes, Learn through first-hand professions, Discover the ocean's depth and the

vastness of space, Time returns to places and important events in the past, Discover the human body insides, Let students share the world with others thereby making their own VR content, Check out how VR can be used in many fields such as health, engineering, entertainment, and real estate. Explore how to incorporate VR into each subject and curriculum, and cultivating excitement and wonder. This is the reason why we should introduce VR for better Learning Experience.

Key benefits of using AR and VR technology in education and learning

Learning for students is easier through gamification and interactivity. Virtual reality and augmented reality Keeps engaged, even when studying difficult subjects, Improves innovative thinking, Fewer distractions, Collaboration has increased among the fosters, can be used for hands-on training, expanded training opportunities by 3D architecture, simulation, and presentations. These are the key benefits for learners.

Challenges Of Ar And Vr Technology In Education

Some of the common challenges of using augmented reality technology are teachers having the struggle to use the new technologies. In addition, not all students have smartphones that can support AR content. In comparison, virtual reality faces completely different obstacles. High hardware costs, accessibility, and lack of quality content are some of the constraints that have prevented VR from being the cutting-edge technology in education. In the VR technology Price plays a very important role as the VR gears are more costly than smartphones. That's why the lack of investment is in this field. Innovations are there in a particular domain, but they are not helping to minimize the cost. The normal learner cannot utilize virtual reality learning technology without good infrastructure. The internet infrastructure is not that powerful to implement VR technology largely. The most important part is the AR/VR content, to make the interactive lessons, making such interactive videos are important. It takes time and manpower with the skillset to make the content. It takes time to finalize the content for the learners. These are the main challenges to implement augmented and virtual reality on a large scale for every learner and student.

Statistics Related To The Ar Vr Technology In Education

"VolodymyrBilyk" conducted a survey on the different age learners and students to know about the penetration of AR and VR technologies in education. He conducted a survey of 1051 respondents. 92% of the respondents know the term Augmented Reality and Virtual Reality. 95% of the learners know about the Ed-tech platforms that are providing video lectures. According to them, education is the 4rth biggest sector for VR investment and the 1st one is the gaming sector. Most of the learners want to spend less amount of money on the VR gears and they want schools to initiate this, and provide VR lessons to students in classrooms. Most of the students want to learn science and history on the virtual reality platforms. [15]

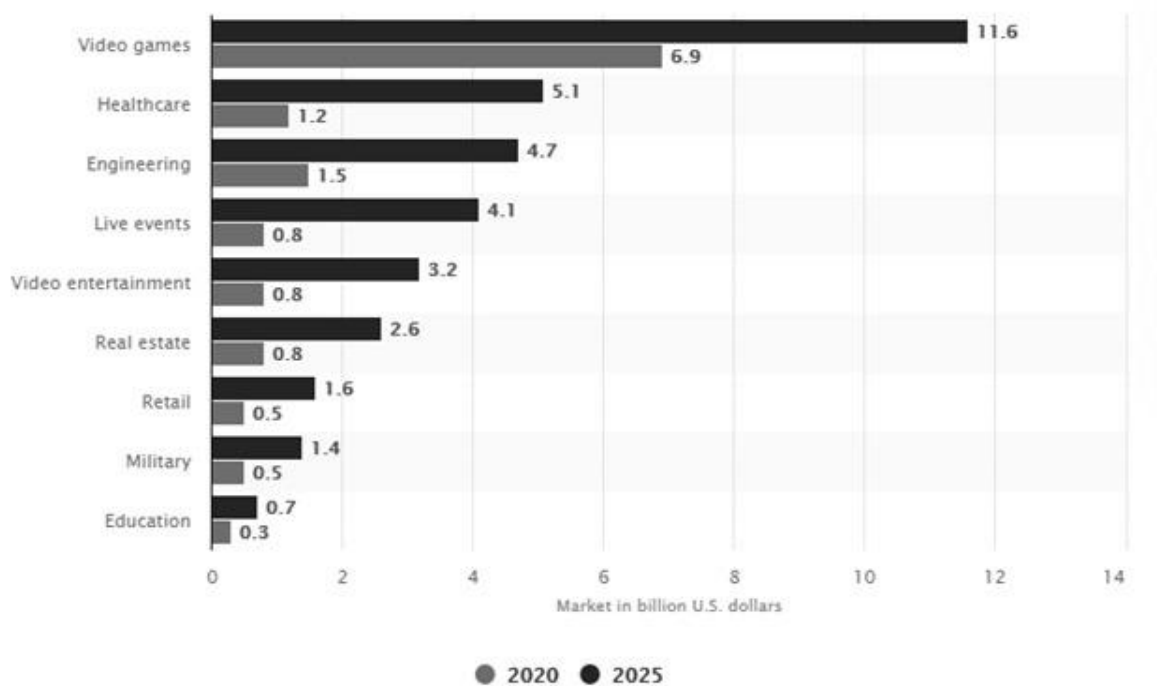


Fig. 2 Size of the augmented and virtual reality (VR/AR) market worldwide in 2020 and 2025, by segment
(Source : Bilyk,2020, theappsolutions.com) [15]

From the above figure, we can conclude that investors are investing more in the entertainment industry. Augmented reality and virtual reality (AR/VR) market are very small and the growth is very restricted.

Augmented Reality

Eighty percent of youngsters own smartphones. Many of them are regular users of smartphones, who use smartphones to play games, to use live-streaming apps, to use social network platforms, to make connections with their friends and family members. Meanwhile, much fewer young adults use smartphones to study, do homework, and dig information about a topic. The potential for an educational Combination of cell phones with artificial intelligence. Augmented reality is a huge domain but this sector is not that explored and fewer innovations made in this domain. We can find some outstanding cases of augmented reality technology in the education sector around the world

Augmented Reality Classrooms

Content with augmented reality and animated character in lecture room lessons could attract awareness and motivate students to study in our dynamic day and age [11]. Displaying information to interact with learners, statistical data to provide them with good information, some fun facts, and the 3D model will help learners to extract more knowledge. Similar classroom apps are produced for medical students. Anatomy is a practical class for medical students. These students can use the AR app to get more knowledge about the anatomy and they can perform various activities on the human body using AR app, these apps contain the 3D model of the human body parts with functions in details. This app can lessen the burden on the practical class using the real human body.

Object modeling using Augmented Reality

Manual preparation and question-solving help to understand every lesson better. Augmented Reality implies 3D model interaction in education. The user create their own model and can provide the features like clarity, sequence, style and color scheme, etc. to give a personal touch for their own understanding. There might be more sophisticated simulations, rather than smartphones, through special gadgets such as holographic lenses and

3D models both are the best ways to learn about difficult concepts. In physics and chemistry, there are many difficult concepts. But these difficult concepts can be demonstrated using the 3D models, students and learners can get more information about these concepts with their working knowledge.

Training Using Augmented Reality

Theoretical expertise is not adequate in many situations to obtain suitable technical competencies. Students/learners of the technical domain particularly require exercises and operational experience in their fields. VR, AR apps can help them by conducting virtual operations and exercises with lectures, simulations, modeling on digital platforms, and finally acquiring some comfort in this technology. There are many AR training simulation apps that provide training from basics to the advanced. These apps use the AR to get inputs from user and these inputs are analyzed in the app and the final output is displayed on the screen within a fraction of seconds with interactive graphics.

Augmented reality app for the kids

“Math live” an India based Ed-tech startup created up to 3rd-grade children. It connects a camera, computer, and specially printed cards. Students under the guidance of an instructor or teacher place cards in front of a camera to scan all the details. “Animal Alphabet” AR Flashcards is similar to the AR App but the application brings the learning letters cards into reality by displaying live animals when the answer is correct. Using such kind of application while teaching the kids will improve their understanding of the things. This learning type will make their engagement with the subjects. As kids are more tend to learn better from the practical approach and this kind of AR app will help the parents and the teachers to teach better to their kids.

Conclusion

The advanced education sector is using augmented reality technology with advanced artificial intelligence for the 3D modeling of objects, using these 3D models and VR gears to provide total engagement with the topic is the main concept. This concept of learning is going to help the students and the learners in the future and most of the Ed-tech platforms are working on this concept of virtual reality. In the near future, the mixed reality concept will make the educational sector a better learning place. This advanced technology combines virtual reality with interactive devices, the user can access all the technology using the sensor-embedded device, users don't have to move back from the videos he can change or operate within the environment.

Due to lack of infrastructure and complications of reality technology. The implementation of virtual reality in the education sector will take time. Currently, the basic models of virtual reality are used in the education sector in some advanced countries. Research and development are going in this field. The gaming sector is implementing this technology widely, investors are investing's hugely in the gaming sector. The education sector is the not most important sector for the investors to invest .there are many prototypes in market for the educational development and to create a better platform that will be easy to use, less complicated, and affordable for every learner.

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